advancement of natural knowledge, we owe it to you more than to any man living.

We beg you to believe that we are grateful, and we shall rejoice if we can in any way prove our sincerity.

We can ill afford to lose either the weight of your name or your guidance at our councils; we can indeed hardly imagine a greater misfortune than the breaking of the bond between you and us. But we cannot complain if, after many years of service, you have found it necessary to loosen your official ties to the University. We regret that your enlarged liberty has not come to you in a form which would have marked our sense of what we owe to you. But we rejoice that an arrangement has been arrived at which will allow your interests still to centre in Cambridge, giving you, at the same time, the opportunity of working in a wider field, where you may do for England what you have already done for Cambridge, and where your services to learning may benefit, not only England, but the whole English-speaking race.

We are proud to sign ourselves
Your friends and pupils,

H. K. ANDERSON.
FRANCIS DARWIN.
A. G. DEW-SMITH.
WALTER GARDINER.
W. H. GASKELL.
ALFRED C. HADDON.
W. B. HARDY.
S. F. HARMER.
WALTER HEAPE.
J. N. LANGLEY.
A. SHERIDAN LEA.
J. J. LISTER.
A. SEDGWICK.
A. C. SEWARD.
ARTHUR E. SHIPLEY.
L. E. SHORE.
H. MARSHALL WARD.

March 9, 1900.

NOTES.

THE preliminary programme of the meeting of the British Association to be opened at Bradford, on September 5, has now been drawn up. The new president is Sir William Turner, F.R.S., and the sectional presidents will be as follows:—Mathematical and Physical Science, Dr. J. Larmor, F.R.S.; Chemistry, Prof. W. H. Perkin, F.R.S.; Geology, Prof. W. G. Sollas, F.R.S.; Zoology (and Physiology), Dr. R. H. Traquair, F.R.S.; Geography, Sir George S. Robertson; Economic Science and Statistics, Major P. G. Craigie; Mechanical Science, Sir Alexander R. Binnie; Anthropology, Prof. John Rhys; Botany, Prof. Sydney H. Vines, F.R.S.; and Corresponding Societies, Prof. E. B. Poulton, F.R.S. There will be a separate department of astronomy in Section A, with Dr. A. A. Common, F.R.S., as chairman. The two evening discourses will be delivered by Prof. Gotch, F.R.S., on "Animal Electricity," and Prof. W. Stroud, on "Range Finders." The lecture to working men will be delivered by Prof. S. P. Thompson, F.R.S., but the subject has not yet been announced.

AT the anniversary meeting of the Royal Irish Academy, on March 16, the following were elected honorary members of the Academy in the section of science:—Aleksandr O. Kovalevskij, St. Petersburg; J. A. Gaudry, Paris; P. G. Tait, Edinburgh; J. H. van t' Hoff, Berlin; J. J. Thomson, Cambridge.

ATTENTION has several times been drawn in these columns to the remarkable properties of Becquerel rays, and, in particular, of those rays emanating from radium. The theory that the radiations consist of material particles is supported by M. Becquerel's recent observations on the action of screens in cutting off the radiations deviated by a magnetic field. From the *Revue Générale des Sciences* for March 15, we learn that a decisive experiment has been performed on this point. It has been established beyond doubt that the emanations from radium communicate a negative charge to bodies on which they fall, while the radium itself becomes charged negatively, and it is inferred that the emanations from radium, or, at any rate, a portion of them, consist of material particles carrying negative charges.

IT will be remembered that the work of the Ben Nevis Observatories would have been brought to an abrupt conclusion in 1898, had not Mr. J. Mackay Bernard come forward with a donation of 500*l.*, which secured its continuance for another year. In 1899, he gave another donation of 500*l.*, under which the directors are now carrying on their important work. The following extract from the report of the Council of the Scottish Meteorological Society, read at the annual general meeting on Monday, shows the present position of the Observatories:—"The position of matters was taken into serious consideration by the council at their meeting on Monday, March 12, when Mr. Mackay Bernard, with a generosity which it is difficult to describe, intimated his wish of making a third donation of 500*l.* to complete the observations in the way desired by the directors in their previous report, and so covering the whole of a sun-spot period of eleven years, and securing at the same time good averages of the meteorological elements for the highest position in the British Islands, and an adjoining Sea-level Observatory at Fort-William. The Ben Nevis work has thus been singularly fortunate in securing very large support from a gentleman, moved by patriotism as well as by a love of knowledge, and the completion of the experiment is secured. This statement does not imply that the council does not continue to be strongly of opinion that the Observatories should not be continued permanently as a national institution, and they are strengthened in this opinion by the character of the results already obtained. The council have now to intimate that another gentleman has offered further support of a very substantial character. In August last, he wrote offering help to the extent, if necessary, of 300*l.*, and the council are now in communication with him in regard to this most liberal offer."

WE learn from the *British Medical Journal* that Dr. W. Osler, F.R.S., professor of medicine in Johns Hopkins University, Baltimore, has sent in an application for the vacant chair of the practice of physic in the University of Edinburgh. Dr. Osler is a graduate of McGill University, Montreal. The other candidates are all graduates of the University of Edinburgh, and in order of seniority are as follows:—Dr. John Wyllie, Dr. Byrom Bramwell, Dr. Alexander James and Dr. G. A. Gibson. Dr. Osler is a Fellow of the Royal College of Physicians of London, while the other candidates are all Fellows of the Royal College of Physicians of Edinburgh.

THE second malaria expedition of the Liverpool School of Tropical Medicine, composed of Drs. Annett, Dutton and Elliott, started yesterday for Nigeria, where they will remain for some time studying malaria and health problems.

THE annual general meeting of the Chemical Society will be held on Thursday, March 29, at 3 p.m. At this meeting the Longstaff Medal will be presented to Prof. W. H. Perken, Junr., F.R.S. In the evening the Bunsen Memorial Lecture will be delivered by Sir Henry E. Roscoe, F.R.S.

SCIENCE has to regret the loss of another of its eminent votaries. Dr. E. J. Lowe, F.R.S., who died on the 10th inst. at Shirenewton Hall, Chepstow, was best known by his indefatigable labours for the determination of the climate of Nottingham, at which place he was born, in November 1825. His meteorological observations began in 1840, and were continued there until 1882, when he removed from Highfield House to Shirenewton Hall. The results of this long series of observations were published in several valuable works, including "The Climate of Nottinghamshire." He also published many other treatises, *e.g.* "Barometrical Tables," as early as 1857, "Weather Prognostics," and the "Natural Phenomena of the Seasons."

This latter work is frequently found very useful for reference to the extreme conditions of weather and unusual occurrences since A.D. 220. In 1856 he published in *Orr's Circle of the Sciences*, in conjunction with Mr. J. B. Scoffern, a "Practical Meteorology," which will well repay perusal at the present day. Mr. Lowe's labours were, however, in no way limited to meteorology. He communicated several joint papers on luminous meteors to the British Association, and assisted the late Prof. E. Forbes in the compilation of his well-known work on "The British Mollusca," and he also wrote several valuable works on British ferns and flowering plants. He was one of the founders and original fellows of the Meteorological Society, of which body he was a life member, and contributed many papers to its *Proceedings* on meteorological subjects and also on earthquake and astronomical phenomena. Mr. Lowe was the inventor of the dry powder tests for the determination of the amount of ozone present in the atmosphere.

THE census of Great Britain will be taken on Sunday, March 31, 1901. The Census Bill was read a third time in the House of Commons on Monday, and as it now stands, the schedules will require the following particulars to be filled in :—(*a*) The name, sex, age, profession or occupation, condition as to marriage, relation to head of family, birthplace, and (where the person was born abroad) nationality of every living person who abode in every house on the night of the census day ; and (*b*) whether any person who so abode was blind or deaf and dumb, or imbecile or lunatic ; and (*c*) where the occupier is in occupation of less than five rooms, the number of rooms occupied by him ; and (*d*) in the case of Wales or the county of Monmouth, whether any person who so abode (being of three years of age or upwards) speaks English only or Welsh only, or both English and Welsh.

AS already announced, an International Congress of Botanists will be held in Paris from the 1st to the 10th of October, in connection with the Exposition. It is proposed to bring before the Congress special subjects for discussion ; and the following have been already approved by the Committee :—(1) Monographic studies ; (2) Species, hybrids and cross-breeds ; (3) Unification of micrometric measures ; (4) Influence of the nature of the substratum on the development of Fungi. The President of the Committee is M. E. Prillieux ; the General Secretary, M. E. Perrot, l'École Supérieure de Pharmacie, Paris. All botanists who notify the General Secretary their desire to become members of the Congress, and who pay the fee (20 francs), will be enrolled as members. Public and general sessions, conferences and collecting trips, displays of fungi, and visits to botanical establishments, are planned.

IN accordance with a recommendation of the Columbus meeting of the Botanical Society of America, and Section G of the American Association for the Advancement of Science, at the Columbus meeting, Prof. W. Trelease, of the Missouri Botanic Garden, has contributed to *Science* (vol. x. No. 255, Nov. 17, 1899) a scheme for the classification of botanical publications. He proposes arranging them under nine heads :—(1) Works of miscellaneous contents ; (2) Biographies of botanists ; (3) Nomenclature, taxonomy and descriptive botany ; (4) Morphology and organography ; (5) Vegetable physiology, including ecology ; (6) Vegetable pathology, including the injuries of plants and therapy ; (7) Evolution, natural selection, &c. ; (8) Man's influence on plants, artificial selection, &c. ; (9) Phytogeography, floras, &c. These are again classified under a large number of subdivisions.

THE Botanical Society of France has elected M. Drake del Castillo President for the year 1900 ; M. Boudier, M. l'abbé Boullu, M. Morot and M. de Seynes, Vice-Presidents.

THE Italian botanical journal, *Erythea*, will be discontinued with the completion of the seventh volume.

A HERBARIUM, collected especially to illustrate the flora of the Rocky Mountains, is being organised in connection with the University of Wyoming.

Bulletin 62 of the West Virginia Agricultural Experiment Station, Morgantown, W. Va., consists of a paper, by Mr. L. C. Corbett, on the effect of incandescent gas-light on the growth of plants. He finds that the incandescent gas-light of the Welsbach burner is an active stimulus to the growth of plants when used at night to supplement daylight. The paper is illustrated by charts and photographs.

AN article of archæological interest appears in the March number of the *Engineering Magazine*, which, in discussing the "Gold-mining prospects in Rhodesia," treats of the discovery of gold ornaments found in ancient ruins in Rhodesia, and their probable age. From the text we gather that ornaments have been found in houses dating back, it is believed, three thousand years ago ; it is also pointed out that the ignorant black population could not have made them. The group of objects representing trays, bracelets, beads, and other articles difficult to specify, has been carefully photographed and reproduced.

THOSE of our readers interested in foreign Lepidoptera may be glad to learn that Mr. E. Swinhoe has recently issued his ninth annual list of specimens for sale.

OUR namesake, *Die Natur*, in its issue of March 11, contains an interesting sketch of the collections in the Berlin Museum. From this we learn that the plan of placing a small map to each specimen, indicative of its geographical distribution, has been adopted ; and likewise that a special saloon is devoted to the fauna of Germany. In the latter we further note that the Bats are exhibited in spirit, as is now the case with a large portion of those in the British Museum.

WE have to congratulate the Trustees of the South African Museum on the completion of the first volume of the *Annals* of that institution, the third and concluding part of which has just come to hand. The great bulk of this fasciculus is taken up by the description of various South African Scorpions and their distant cousins the Solifugæ, or "False Spiders," two genera of the latter being recorded for the first time from the Cape district. The volume closes with a short paper, by Dr. R. Broom, on two new species of Dicynodont Reptiles from the well-known Karoo series ; and it is a matter of satisfaction to find not only that the study of extinct forms comes within the province of this useful publication, but that such a competent observer and anatomist as Dr. Broom has turned his attention to this branch of research.

CONFRONTED with the difficulty of mounting the bones of the limbs of extinct mammals at their proper angles of inclination, Prof. H. F. Osborn has undertaken a careful comparative investigation of those of the elephant and the rhinoceros, in the hope of finding a clue from the conformation of the bones themselves as to their true position in the mounted skeleton. The results of his studies are given to the public in the February number of the *American Naturalist*. In regard to the elephant, he makes the noteworthy statement "that the study of the skeleton alone would have given us a very faulty conception of the animal." He is led to conclude that in all primitive ungulates the long bones of the limbs were set at considerable angles to one another, as in the majority of the existing representatives of the order, and that the vertical position they occupy in the elephant is an acquired feature. To quote his own words :—"The straightening of the limb is an adaptation designed to transmit the increasing weight through a vertical shaft; correlated with it is the shifting of the facets [that is to say, the upper and lower articular surfaces] into the direct line of pressure, and the alteration of their planes from an oblique to a right or horizontal angle with relation to the vertical shaft."

MR. FREDERIC W. SIMONDS writes to us from the University of Texas with reference to the communications on "Floating Stones," which appeared in NATURE early in the present year (pp. 278, 318). He calls attention to a paper of his, entitled "Floating Sand: an Unusual Mode of River Transportation," published in the *American Geologist* (January 1896), in which he described experiments made to determine how sand may be floated, what sand will float, and why sand will float. It was found that sand grains will float in perfectly still water for an indefinite time, that the grains which float are not necessarily siliceous, and that the property of floating depends to a large extent upon the angularity, that is, the shape, of the grains. Several of the characteristics mentioned by our correspondents are referred to in Mr. Simonds's paper.

THE Statistics of Mineral Production in India for the five years 1894 to 1898 have just been issued by the Department of Revenue and Agriculture. About a million tons of salt are produced annually from rock-salt, from salt lakes and wells, and from sea-water. The coal industry is expanding rapidly, the output having increased from nearly three million tons in 1894 to over four and a half million tons in 1898. The coal is employed for railways, coasting and river steamers and factories, but the conditions of transport are not yet sufficiently developed. Nearly all the gold produced in India comes from the State of Mysore, and in 1898 it amounted to over four hundred thousand ounces, valued at 4*l.* an ounce. Nearly twenty million gallons of petroleum were obtained in 1898 from Burma and Assam. Other "minerals" of minor economic importance include iron-ores, tin-ores, saltpetre, gems and precious stones.

WE have received a catalogue of the first four thousand samples in the soil collection of the U.S. Department of Agriculture, prepared by Mr. Milton Whitney, chief of Division of Soils. To all interested in soil investigations this publication will be a useful and suggestive work of reference. Not only does the collection contain specimens of soils from the chief geological formations of the United States, it also includes samples from many of the important agricultural districts, and likewise special collections of wheat soils, tobacco soils, &c., from all parts of the world. Remarks are made concerning the collecting of specimens, their arrangement and classification; and it is stated that sets of representative soils are arranged in boxes, to be distributed to agricultural colleges and experiment stations, with explanatory text regarding their origin, chemical and physical peculiarities, &c. One object in publishing the catalogue is to suggest exchanges with institutions in other countries.

IN an article on the Lower Cambrian terrane in the Atlantic province (*Proc.* Washington Acad. Sciences, vol. i. February 1900), Mr. C. D. Walcott discusses some changes in grouping which have been proposed by Mr. G. F. Matthew, and would, if adopted, lead to the abandonment of the term Middle Cambrian, and to the placing of the *Olenellus*-zone in the Pre-Cambrian ("Etcheminian" terrane). Mr. Walcott maintains that the Etcheminian is in reality Lower Cambrian, and equivalent to strata which elsewhere hold the Olenellus fauna—the representatives of the genus having a range of over a thousand feet at the typical locality in Vermont.

AMONG the earthquakes felt in Asia Minor in 1896, one of the most interesting originated near Balikesri on September 14. This shock is described by Dr. G. Agamennone in a paper published in the last *Bollettino* of the Italian Seismological Society (vol. v. No. 6). Though its intensity was not more than 7 or 8 of the Rossi-Forel scale, the shock was felt over an area of about 400 km. in diameter, and was even recorded by a horizontal pendulum at Strassburg, which is 1850 km. from the epicentre. The mean surface-velocity of the preliminary tremors was about 8½ km. per second, and of the slow undulations about 2½ km. per second.

THE success which attended the "Illustrated Annual of Microscopy" last year has induced the publishers (Messrs. Percy Lund and Humphries) to bring out a second number this year. If for no other reason, it is valuable for its summary of new instruments and apparatus put on the market by the leading opticians during the twelvemonth. We are glad to see the popular side of microscopy well represented, since papers of a highly specialised character find a more appropriate medium of publication in the proceedings and transactions of societies. On the other hand, brief abstracts of technical methods are of interest to every one, and in this category we include Dr. Hollborn and Mr. Angus's history and theory of staining, Mr. W. H. Merrett's metallography of iron and steel, Mr. Strangways' hints on dental histology, Mr. Palmer's article on micro-spectrography, Mr. Rheinberg's multiple colour illumination; and notes by Mr. Harris on eucaine hydrochlorate, and by Prof. Hartog on saprolegnieæ. Photo-micrography receives treatment at the hands of Mr. Albert Norman, Don Domingo de Orueta, Mr. F. Noad Clarke (in connection with entomology) and Mr. E. R. Turner, who treats of "stereo-photo-micrography, chromo-photo-micrography, and stereo-chromo-photo-micrography"; while popular microscopy is well catered for by the beautiful coloured frontispiece of "Pond Life" and coloured plate of *Daphnia hyalina*, and by papers on freshwater mites, yeast, plant hairs, molluscan palates, polarised light and the variety of form of diatoms from an artistic standpoint, illustrated by outlines of Triceratia. Dr. M. C. Cooke's skits and songs resuscitated from the early annals of the Quekett Club are most amusing.

WE have received from the United States Weather Bureau the "Meteorological Chart of the Great Lakes," with a summary of the season of 1899. This work, which is accompanied by a large amount of explanatory text, in addition to tables and maps, contains much useful information relating to the storms, monthly rainfall, ice, &c., in the Lake region. The season of inter-lake navigation in 1899 began on April 29, the opening being late on account of the vast amount of ice during April. With the exception of Lake Erie, and probably Lake Ontario, the water was higher than in the two previous years; on Lake Superior the water was higher than that of any previous year since 1876. The work contains some interesting observations of fog. The most frequent formation reported is that of heavy banks, with intervals of clear weather, and narrow bands, which extend for many miles in length. One vessel will run for hours in the band of fog, while another several miles distant will be running parallel with it in clear weather, and can hear the fog whistle and see the wall of the fog bank.

THE *Annuaire* of the Municipal Observatory of Paris (Montsouris) for the year 1900 extends to 578 pages, and contains an immense amount of useful information, and a special analysis of the work relating to the year 1898. The Montsouris Observatory was established in 1871, and its operations embrace: (1) Meteorological physics, including atmospheric electricity, the distribution of rainfall and thunderstorms in the Department of the Seine, and the regular registration of all the usual meteorological elements at Montsouris and at the St. Jacques tower. In this section we may specially mention a useful comparative *résumé* of mean and extreme values for the twenty-five years 1873–98. (2) Chemical analyses of air and water in different parts of Paris, and researches relating to the comparative value of various disinfecting agents. (3) Micrographical investigations, with a view to determining the amount and nature of organic dust in open spaces and in dwelling houses. The work of each section is under the superintendence of an eminent scientific authority, and the control of the establishment is invested in a permanent Committee appointed by the Municipal Council of Paris.

THE earliest authentic record of bubonic plague has hitherto been accepted as dated 300 B.C. Drs. F. Tidswell and J. A. Dick have, however, recently brought evidence before the Royal Society of New South Wales to show that the epidemic of 1141 B.C., described in the First Book of Samuel (chs. iv.–vi.), was true bubonic plague. After the Philistines had captured the Ark of the Covenant and taken it to Ashdod, severe illness broke out among the people. "The hand of the Lord was heavy upon them of Ashdod, and He destroyed them and smote them with emerods." The Ark was afterwards taken to Ekron, and here again we are told "There was a deadly destruction throughout all the city . . . and the men that died not were smitten with the emerods, and the cry of the city went up to heaven." The word "emerod" has usually been taken to mean hæmorrhoids, but in the revised version of the Old Testament it is stated to mean tumour or plague boil. The epidemic in Philistia occurred at the time of the regular plague season, and mice are mentioned in connection with it, which furnishes additional evidence that the epidemic was plague, for a connection between the death of rats and plague at Bombay and elsewhere has been clearly established. Taking all the facts into consideration, there appears to be contained in the few chapters of I. Samuel an account of an epidemic of bubonic plague that occurred more than three thousand years ago, or more than eight hundred years previous to the hitherto accepted historic record.

PART IV. of the sixth revised edition of Foster's "Text-Book of Physiology" has been published by Messrs. Macmillan and Co., Ltd. It deals with the senses, under sight, hearing, taste and smell, and cutaneous and some other sensations. Dr. W. H. R. Rivers has assisted Sir Michael Foster in the revision of these chapters, and his name appears upon the title-page with that of the original author.

IN the *Transactions* of the Nova Scotian Institute of Science has appeared a series of papers, by Prof. MacGregor and his pupils, on the application of the ionic hypothesis to mixtures of solutions of electrolytes. Vol. x. contains a paper by Mr. J. Barnes treating of the viscosity of mixtures of solutions of various salts of sodium, potassium and barium, in which it is shown that general formulæ developed by Prof. MacGregor hold in this case also. Given data as to the viscosity and electrical conductivity of the constituent solutions, the viscosity of dilute solutions of the salts under consideration can be predicted by the dissociation theory within the limits of experimental error.

THE additions to the Zoological Society's Gardens during the past week include a Silver Pheasant (*Euplocamus nycthemerus*, ♂) from China, presented by the Rev. J. O. Cousmaker; a Greater Black-backed Gull (*Larus marinus*), European, presented by Mr. W. Baker; two Starred Lizards (*Agama stellio*) from Egypt, presented by Mr. Stanley S. Flower; a Green Lizard (*Lacerta viridis*), European, presented by Mr. W. J. R. Elgy; two Grey Struthideas (*Struthidea cinerea*) from Australia, a Bennett's Wallaby (*Macropus bennetti*) from Tasmania, deposited; a Black-faced Ibis (*Theristicus caudatus*) from South America, purchased.

OUR ASTRONOMICAL COLUMN.

COMET 1899 V.—Herr S. K. Winther, of Copenhagen, communicates an ephemeris of this comet to the *Astronomische Nachrichten* (Bd. 152. No. 3930), from which the following is abstracted:—

Ephemeris for 12*h. Berlin Mean Time.*

1900.		R.A. h. m. s.		Decl. ° ′
March 23	...	21 38 23	...	+51 58·7
25	...	42 36	...	52 43·1
27	...	46 50	...	53 27·3
29	...	51 5	...	54 11·2
31	...	21 55 22	...	+54 54·8

NEW VARIABLE IN CYGNUS.—In the *Astronomische Nachrichten* (Bd. 152, No. 3629), Mr. A. Stanley Williams, of Hove, draws attention to the variability of the star

$$\text{B.D.} +46^\circ{\cdot}2966 \left\{\begin{matrix}\text{R.A.} & 20\text{h.}\ 29\text{m.}\ 38{\cdot}0\text{s.} \\ \text{Decl.} & +\ 46^\circ\ 15'{\cdot}2\end{matrix}\right\}(1900).$$

The variable was detected from photographs taken with a Grubb portrait lens of 4·4 inches aperture. The brightness was found to change from 9·1 magnitude, on 1899 October 2, to 10·0 magnitude, on 1900 February 11.

Inspection of reproductions from photographs of the star taken by Prof. Max Wolf confirms the variability. In a photograph taken June 1, 1891 (*Knowledge*, 1891, p. 189), the estimated magnitude of the star is 10·2, while on another taken September 9 and 10, 1891 (*Knowledge*, 1891, p. 188), the estimated magnitude is only 9·6. Most of the observations, visual and photographic, furnish an approximate period of 31·0 days.

ESCAPE OF GASES FROM PLANETARY ATMOSPHERES.—In the *Astrophysical Journal*, vol. xi. pp. 36–43, January 1900, Mr. S. R. Cook, of the University of Nebraska, particularises part of the investigation of Dr. G. Johnstone Stoney, who omitted from his discussions the determination, by the kinetic theory, of the number of molecules which would have a velocity sufficient to enable them to escape from the earth or planet, assuming retarding media to be absent. The present author, in commencing this discussion, refers to this velocity as the *critical velocity* of the gas.

The dynamical constants are computed for four different conditions, including those adopted by Dr. Stoney, Prof. Cleveland Abbe (from balloon ascensions at Paris and Berlin), and the recent theoretical conclusions of Ferrel. From the result, it is concluded that under the most probable conditions there would be practically no escape of the gases nitrogen, oxygen, hydrogen and helium from either the earth or the major planets. An atmosphere like that on the earth, however, would not remain on the moon. Tables are given showing the computed temperatures at which the above gases would possess the *critical velocity* for dissipation at the outer limits of the atmospheres of the various planets.

NEW MODE OF USING THE CONCAVE DIFFRACTION GRATING.—In the current number of the *Mem. Soc. degli Spettroscopisti Ital.* vol. xxviii. pp. 241–244, Dr. G. B. Rizzo, of the Physical Institute at Turin, gives a description of his successful experiments dealing with the manipulation of a Rowland Concave Grating in other than the usual manner. The spectroscope is generally so arranged that the grating and eyepiece or photographic plate are at opposite ends of a rigid beam which keeps them at the constant distance of the radius of curvature of the grating, the plate being placed tangential to the focal curve. This gives for a small distance on either side of the axis a practically *normal* spectrum, and although not normal, the other orders of spectra are all brought to focus on the same focal circle, having as diameter the radius of curvature of the grating. It is evident, then, that whatever order of spectrum is being observed *normally* at the end of the beam, there will be another image, of the same order, on the other side of the central image (which has been symmetrically reflected from the grating without diffraction or dispersion), the lines of which will be in focus along a circle having a radius equal to half the grating's radius of curvature. This second spectrum Dr. Rizzo designates the *internal* spectrum, and its position is defined by the condition that

$$\sin\theta = -2\sin i,$$

where θ is the angle of diffraction,
and i ,, ,, ,, incidence,
reckoned from the centre of the grating.